Abstract Submitted
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Non-affine deformation in semi-flexible polymer gels[1] ANINDITA BASU, Department of Physics and Astronomy, University of Pennsylvania, WEN QI, Institute for Medicine and Engineering, University of Pennsylvania, XIAOMING MAO, TOM LUBENSKY, Department of Physics and Astronomy, University of Pennsylvania, PAUL JANMEY, Institute for Medicine and Engineering, University of Pennsylvania, ARJUN YODH, Department of Physics and Astronomy, University of Pennsylvania — Compared to flexible polymer gels, semi-flexible filamentous biopolymer networks generally have larger elastic moduli, marked strain-stiffening behavior, and a pronounced negative normal stress when deformed under shear. Theoretical models based on either entropic stretching or enthalpic bending of polymer segments can capture these unusual behaviors to some extent but differ in their predictions about whether the deformation of these materials is affine. We test the validity of this affine assumption by embedding fluorescent tracer beads of different sizes within different bio-polymer gels and quantifying their displacements under shear deformation using confocal microscopy. Gels studied include fibrin and collagen gels. Fiber concentration and pH of the gels are systematically varied to understand the effect of network mesh-size, filament thickness and persistence length on non-affinity. The gels are studied under a wide range of applied strain, well into the strain-stiffening regimes.

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