

Abstract Submitted  
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**Nonlinear elasticity of disordered fiber networks** JINGCHEN

FENG, Bioengineering Department and Center for Theoretical Biological Physics, Rice University, Houston TX, 77251-1892,USA., HERBERT LEVINE, Bioengineering Department and Center for Theoretical Biological Physics, Rice University, Houston TX, 77251-1892,USA, XIAOMING MAO, Department of Physics, University of Michigan, Ann Arbor MI 48109-1040, USA., LEONARD M. SANDER, Physics Complex Systems, University of Michigan, Ann Arbor MI 48109-1040, USA. — One of the most striking mechanical properties in disordered biopolymer gels is strong nonlinearities. In the case of athermal gels (such as collagen- I) the nonlinearity has long been associated with a crossover from a bending dominated to a stretching dominated regime of elasticity. The physics of this crossover is related to the existence of a central-force isostatic point and to the small bending modulus for most gels. This crossover induces scaling behavior for the elastic moduli. In particular, for linear elasticity such a scaling law has been demonstrated by Broedersz et al. We generalize the scaling to the nonlinear regime with a two-parameter scaling law involving three critical exponents. We do numerical testing of the scaling law for two disordered lattice models, and find a good scaling collapse for the shear modulus in both the linear and nonlinear regimes. We compute all the critical exponents for the two lattice models and discuss the applicability of our results to real systems.

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