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**Stretching and bending in cross-linked biopolymer networks**

CLAUS HEUSSINGER, ERWIN FREY, Arnold-Sommerfeld Center for theoretical physics, University of Munich — The elastic response of cross-linked biopolymer networks is usually interpreted in terms of affine stretching models, adopted from the theory of rubber-elasticity valid for flexible polymer gels. Unlike flexible polymers, however, stiff polymers have a highly anisotropic elastic response, where the low-energy elastic excitations are actually of bending nature. As a consequence, similar to springs connected in series, one would expect the softer bending mode to dominate the elastic energy rather than the stiff stretching mode. We propose a theory that, unlike recent affine models, properly accounts for the soft bending response of stiff polymers. It allows calculating the macroscopic elastic moduli starting from a microscopic characterization of the (non-affine) deformation field. The calculated scaling properties for the shear modulus are in excellent agreement with the results of recent simulations obtained in simple two-dimensional model networks, and can also be applied to rationalize bulk rheological data in reconstituted actin networks.

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