

Abstract Submitted
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Avalanches, hardening and softening in dense cross-linked actin networks JAN ASTROM, CSC – Finnish IT Center for Science, Esbo, Finland, SUNIL KUMAR, Indian Institute of Technology Madras, India, ILPO VATTULAINEN, Tampere University of Technology, Finland, MIKKO KARTTUNEN, The University of Western Ontario, Canada — Actin filament networks enable the cytoskeleton to adjust to internal and external forcing. These active networks can adapt to changes by dynamically adjusting their crosslinks. Here, we study actin filaments as elastic fibers having finite dimensions. We employ a full three-dimensional model to study the elastic properties of actin networks by computer simulations. We model a dense actin network with the crosslinks being approximately $1\mu\text{m}$ apart. The results show that dense actin networks, without any pre-straining, are characterized by (a) strain hardening without entropic elasticity, (b) 'viscotic' hysteresis in the case of strong crosslinks, (c) avalanches of crosslink slippage leading to strain softening in the case of breakable crosslinks, and (d) spontaneous formation of stress fibers in the case of active crosslink formation and destruction. We will discuss the relation to recent experimental observations.

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