Dynamic Role of Cross-Linking Proteins in Actin Rheology

Taeyoon Kim,[†] Wonmuk Hwang,[‡] and Roger D. Kamm[§]

[†]Institute for Biophysical Dynamics, University of Chicago, Chicago, Illinois; [‡]Department of Biomedical Engineering and Materials Science and Engineering Program, Texas A&M University, College Station, Texas; and [§]Department of Mechanical and Biological Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts
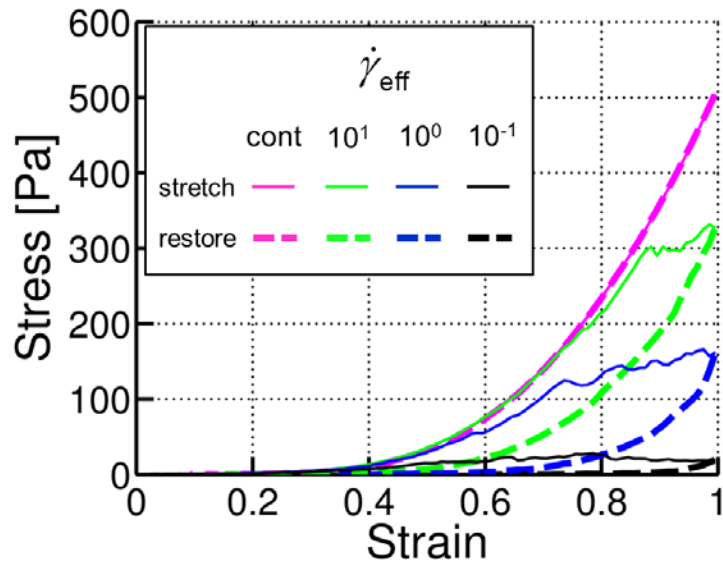
Supporting Material

FIGURE S1   Hysteresis of actin networks with various strain rates ($\dot{\gamma}_{\text{eff}}$). Colors indicate different $\dot{\gamma}_{\text{eff}}$, and solid lines represent a stretching phase with dashed ones indicating a restoring phase (*legend*). The control case (*magenta*) has no unbinding event, corresponding to very large $\dot{\gamma}_{\text{eff}}$.
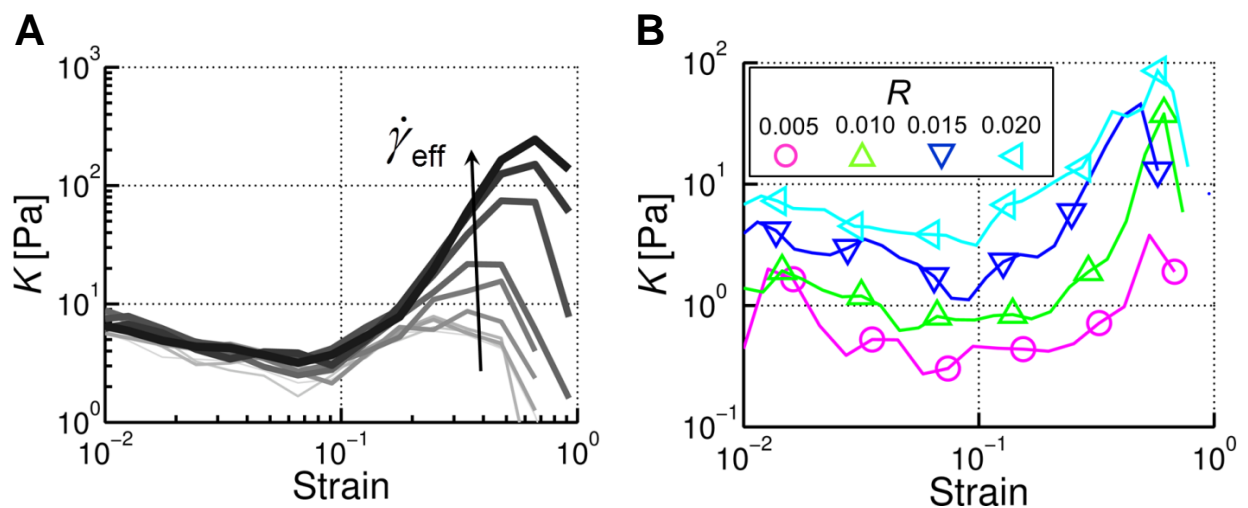

FIGURE S2   Differential modulus, K, with various (*A*) $\dot{\gamma}_{\text{eff}}$ and (*B*) R. (*A*) $\dot{\gamma}_{\text{eff}}$ is varied at 0.001-1 s^{-1}. Darker and thicker lines indicate greater $\dot{\gamma}_{\text{eff}}$. (*B*) Symbols and colors indicate different R (*legend*).
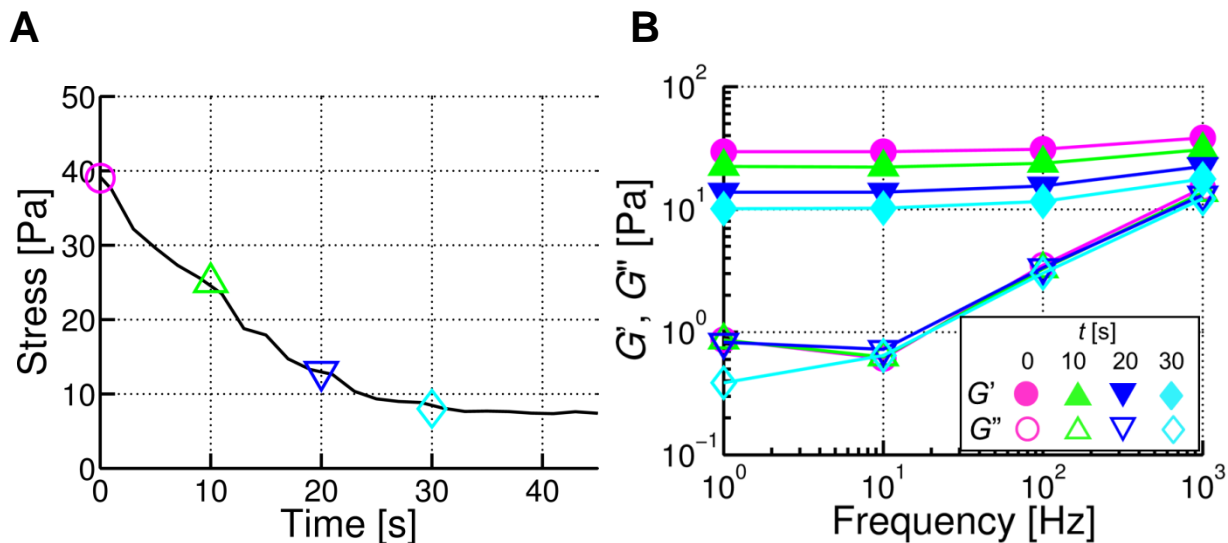
FIGURE S3 Aging of actin networks. (*A*) A stress relaxation curve of an actin network after shearing to $\gamma = 0.5$ without unbinding. Networks were extracted at $t = 0$ (*magenta circles*), 10 (*green triangles*), 20 (*blue inverted-triangles*), and 30 s (*cyan diamonds*). (*B*) G' (*solid*) and G'' (*open*) of the networks extracted from (*A*).
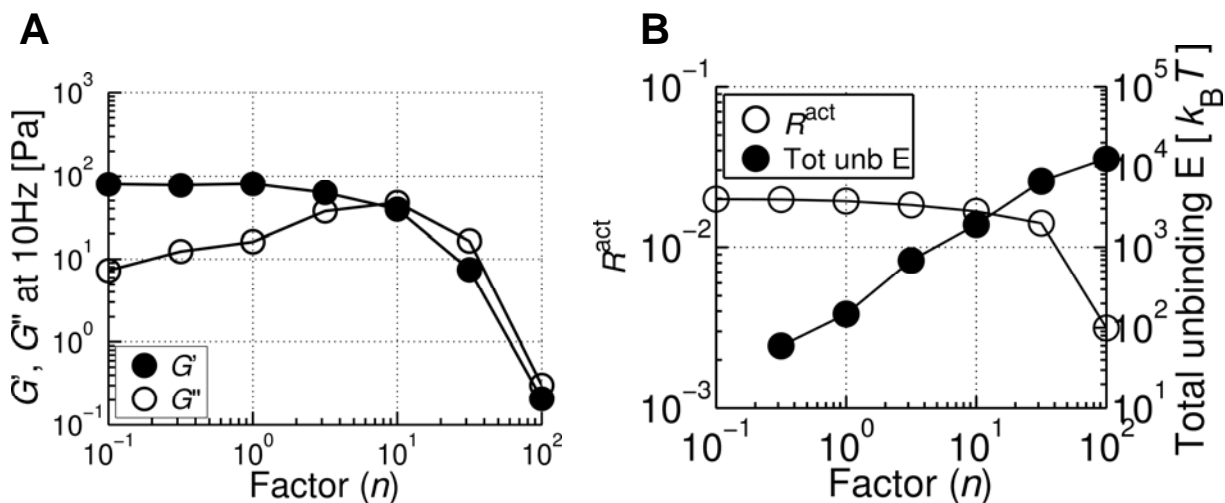

FIGURE S4 (*A*) G' (*solid*) and G'' (*open*) at 10 Hz with various k_{ub}^0 ($= n \times k_{ub,r}^0$). (*B*) Density of active ACPs bound to two filaments, R^{act}, (*open*) and the sum of energy dissipated by unbinding of ACPs bearing more than 1 pN (*solid*).
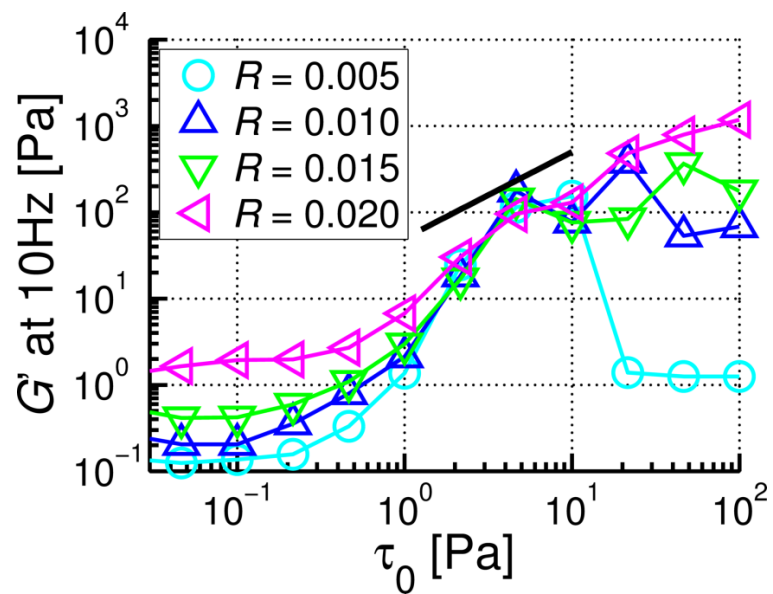
FIGURE S5 *G'* depending on prestress (τ_0) level with various *R* (*legend*). The black line indicates linear scaling, $G' \sim \tau_0$.