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Reversible mechano-memory in sheared cross-linked actin networks[1] SAYANTAN MAJUMDAR, MARGARET L. GARDEL, MRSEC and the James Franck Institute, University of Chicago, IL 60637 — Is it possible to control the shear modulus of a material mechanically? We reconstitute a network of actin filaments cross-linked with Filamin A and show that the system has remarkable property to respond under shear in a deformation history dependent manner. When a large shear stress pulse is applied to the system, the system remembers the direction of deformation long after the stress pulse is removed. For the next loading cycle, shear response of the system becomes anisotropic; if the applied pulse direction is same as the previous one, the system behaves like a viscoelastic solid but a transient liquefaction is observed if the pulse direction is reversed. Imaging and normal force measurements under shear suggest that this anisotropic response comes from stretching and bending dominated deformation directions induced by the large shear deformation giving rise to a direction dependent mechano-memory. The long time scale over which the memory effect persists has relevance in various deformations in cellular and multicellular systems.

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