

Abstract Submitted
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Nonlinear mechanical response of the extracellular matrix: learning from articular cartilage SARAH KEARNS, MOUMITA DAS, Rochester Institute of Technology — We study the mechanical structure-function relations in the extracellular matrix (ECM) with focus on nonlinear shear and compression response. As a model system, our study focuses on the ECM in articular cartilage tissue which has two major mechanobiological components: a network of the biopolymer collagen that acts as a stiff, reinforcing matrix, and a flexible aggrecan network that facilitates deformability. We model this system as a double network hydrogel made of interpenetrating networks of stiff and flexible biopolymers respectively. We study the linear and nonlinear mechanical response of the model ECM to shear and compression forces using a combination of rigidity percolation theory and energy minimization approaches. Our results may provide useful insights into the design principles of the ECM as well as biomimetic hydrogels that are mechanically robust and can, at the same time, easily adapt to cues in their surroundings.

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