

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Mechanical response of biopolymer double networks¹ JOSHUA CARROLL, MOUMITA DAS, Rochester Institute of Technology — We investigate a double network model of articular cartilage (AC) and characterize its equilibrium mechanical response. AC has very few cells and the extracellular matrix mainly determines its mechanical response. This matrix can be thought of as a double polymer network made of collagen and aggrecan. The collagen fibers are stiff and resist tension and compression forces, while aggrecans are flexible and control swelling and hydration. We construct a microscopic model made of two interconnected disordered polymer networks, with fiber elasticity chosen to qualitatively mimic the experimental system. We study the collective mechanical response of this double network as a function of the concentration and stiffness of the individual components as well as the strength of the connection between them using rigidity percolation theory. Our results may provide a better understanding of mechanisms underlying the mechanical resilience of AC, and more broadly may also lead to new perspectives on the mechanical response of multicomponent soft materials.

¹This work was partially supported by a Cottrell College Science Award

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Date submitted: 05 Nov 2015

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