Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Physics of soft hyaluronic acid-collagen type II double network gels SVETLANA MOROZOVA, MURUGAPPAN MUTHUKUMAR, University of Massachusetts — Many biological hydrogels are made up of multiple interpenetrating, charged components. We study the swelling, elastic diffusion, mechanical, and optical behaviors of 100 mol% ionizable hyaluronic acid (HA) and collagen type II fiber networks. Dilute, 0.05-0.5 wt% hyaluronic acid networks are extremely sensitive to solution salt concentration, but are stable at pH above 2. When swelled in 0.1M NaCl, single-network hyaluronic acid gels follow scaling laws relevant to high salt semidilute solutions; the elastic shear modulus G' and diffusion constant D scale with the volume fraction ϕ as $G' \sim \phi^{9/4}$ and $D \sim \phi^{3/4}$, respectively. With the addition of a collagen fiber network, we find that the hyaluronic acid network swells to suspend the rigid collagen fibers, providing extra strength to the hydrogel. Results on swelling equilibria, elasticity, and collective diffusion on these double network hydrogels will be presented.

Murugappan Muthukumar
University of Massachusetts

Date submitted: 12 Nov 2014 Electronic form version 1.4