Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Bio-Inspired Composite Interfaces: Controlling Hydrogel Mechanics via Polymer-Nanoparticle Coordination Bond Dynamics NIELS HOLTEN-ANDERSEN, Massachusetts Institute of Technology — In soft nanocomposite materials, the effective interaction between polymer molecules and inorganic nanoparticle surfaces plays a critical role in bulk mechanical properties. However, controlling these interfacial interactions remains a challenge. Inspired by the adhesive chemistry in mussel threads, we present a novel approach to control composite mechanics via polymer-particle interfacial dynamics; by incorporating iron oxide nanoparticles (Fe3O4 NPs) into a catechol-modified polymer network the resulting hydrogels are crosslinked via reversible coordination bonds at Fe3O4 NP surfaces thereby providing a dynamic gel network with robust self-healing properties. By studying the thermally activated composite network relaxation processes we have found that the polymer-NP binding energy can be controlled by engineering both the organic and inorganic side of the interface.

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Date submitted: 14 Nov 2014 Electronic form version 1.4