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Block copolymer self-assembly for the responsive reinforcement of injectable protein hydrogels M.J. GLASSMAN, Massachusetts Institute of Technology, S. LI, J. CHAN, California Institute of Technology, B.D. OLSEN, Massachusetts Institute of Technology — Shear-thinning injectable protein hydrogels are emerging as important biomaterials for the minimally-invasive implantation of scaffolds for tissue engineering and drug delivery. In this work, responsive block copolymer self-assembly is employed to trigger nanostructure formation in hydrogels made from artificial associative proteins, producing hydrogels with resistance to shear-thinning post injection, reduced erosion rate, higher toughness, and dramatically reduced creep compliance. Polymer-protein-polymer triblock copolymers have been synthesized by conjugating poly(N-isopropylacrylamide) to either end of a protein midblock decorated with self-associating pentavalent sticker domains. Self-assembly at elevated temperatures introduces a second physical network into the protein hydrogel with an independent and tunable relaxation time. The phase behavior of these dual-network hydrogels has been explored, revealing the ability to access nanostructured morphologies, and the effect of self-assembled polymer domains on the linear mechanics and toughness of injectable hydrogels has been investigated.

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