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**Recovery and Stiffening -Transition of Hydrogels Formed Via Peptide Self-Assembly** BULENT OZBAS, KARTHIKAN RAJAGOPAL, JOEL P. SCHNEIDER, DARRIN J. Pochan, Materials Sci Eng and Chemistry and Biochemistry, Univ. of Delaware — In this work we present the local nano- and overall network structure, and resultant viscoelastic properties, of hydrogels that are formed via  $\beta$ -hairpin peptide self-assembly that is triggered either by increasing the solution pH, temperature or ionic strength. These physiological stimuli induce the random-coil to  $\beta$ -sheet intramolecular folding event that, in turn, causes intermolecular self-assembly. The peptide molecules are locally amphiphilic with two linear strands flanking a central tetrapeptide turn sequence. SANS and TEM studies reveal that the peptide molecules self-assemble into semiflexible, fibrillar structures with monodisperse width that is dictated by the strand length of the molecule. Rheological measurements demonstrate that the hydrogels behave as soft-solid materials with tunable rigidity. Hydrogels recover their initial viscoelastic properties after cessation of high magnitude of strain due to the physically crosslinked network structure and strong inter-fibrillar interactions. These interactions can be turned off by either condensing anions or covalently attaching PEG chains on the lysine-decorated fibrillar surfaces. In addition, stiffening transitions are observed when the hydrogels are cooled due to the hydrogen bonding capability of boric acid/borate ion with lysine residues.

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