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Self Assembly of β-Hairpin Peptides into Hydrogel Networks: Tuning Supramolecular Properties Through Molecular Design TUNA YUCEL, Materials Science and Engineering, University of Delaware , CHRIS MICKLITSCH, JOEL SCHNEIDER, Chemistry and Biochemistry, University of Delaware, DARRIN POCHAN, Materials Science and Engineering, University of Delaware — Monomeric peptides were designed to undergo reversible, intramolecular folding with external stimuli (e.g. pH, temperature, salt) to form β-hairpins that consequently self assemble into a hydrogel network rich in β-sheet. The design was composed of a turn sequence (V^DPPT) flanked by extended strands containing alternating lysine and valine residues. The hydrophobicity of the peptides was altered through replacing valine residues in the arms with residues such as, norvaline, norleucine and isolecine. Circular dichroism spectroscopy illustrated that random-coil to β-sheet transition could be tuned from 35^oC to below 5^oC at pH 9, while the transition pH at T_{room} could be shifted from pH 9 down to pH 7. TEM illustrated that all peptides self-assembled into fibrilar networks. Single fibril dimensions were 3 nm as measured using TEM and small-angle neutron scattering, consistent with the proposed self-assembly mechanismof fibrils with a molecular bilayer cross-section. There was a direct correlation between fibril morphology and consequent changes in the nature of junction points and gel rigidity as observed by TEM, and oscillatory rheology, respectively.

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