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Effect of Strand Symmetry on the Nanostructure and Material Properties in Beta-Hairpin Peptide Hydrogels ROHAN HULE, DARRIN POCHAN, Department of Materials Science and Engineering and Delaware Biotechnology Institute, University of Delaware, RADHIKA NAGARKAR, JOEL SCHNEIDER, Department of Chemistry and Biochemistry — Hydrogels have been established as promising biomaterials for applications such as scaffolds for tissue engineering, controlled drug delivery and cell encapsulation. De novo designed beta hairpin peptides, capable of undergoing self assembly and hydrogel formation, were investigated that contain asymmetric beta strand arms surrounding a turn sequence. The stimuli responsive self assembly of the hydrogels occurs via an intramolecular folding and strand interdigitation mechanism. CD and FTIR indicate a beta sheet secondary structure. WAXS shows a fibril structure reminiscent of the cross beta spine. SANS has been employed to globally quantify the local structure as being rod-like. Modification of the strand registry results in fibrils with non-twisting, laminated vs. twisted nanostructure. Fibril dimensions as measured by TEM and AFM corroborate the interdigitated assembly. Bulk material properties of these hydrogels studied using oscillatory rheology vary significantly for the different morphologies. Differences in the peptide registry that drive hydrogel nanostructure and the consequent material properties can be potentially utilized for usage in specific biomaterial applications.

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