

Abstract Submitted
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Structure-Property Relations in beta-Hairpin Peptide Hydrogels

ROHAN HULE, DARRIN POKHAN, Materials Science and Engineering, University of Delaware — A de novo designed beta hairpin peptide, capable of undergoing intramolecular folding and consequent intermolecular self-assembly into a fibril-based network that forms a hydrogel, has been studied. A combination of SANS and cryo-TEM have been used to quantitatively investigate the nanofibrillar hydrogel network morphology. An increase in the peptide concentration resulted in a denser fibrillar network as revealed via a change in the high q mass fractal exponent from 2.5 to 3. This is accompanied by a decrease in the measured correlation length from 23 to 16 Angstroms, indicative of the increase in the number of crosslinks and a reduction in the interfibril distances in the proximity of individual crosslinking points. In the USANS regime, a slope of -4 is indicative of gel microporosity. These changes, both, at the network as well as the individual fibril length scales can be directly visualized in situ by cryo-TEM. Fibrillar nanostructure and the network morphology are directly related and can be used to tune the bulk hydrogel stiffness, as studied via oscillatory rheology. Knowledge of the precise nano-through microstructure can help in the formation of specific structure-property relationships in these novel peptide-based hydrogels.

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