

Abstract Submitted
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Fractal Nature of Semiflexible Networks in beta-Hairpin Peptide Hydrogels ROHAN HULE, DARRIN Pochan, Materials Science and Engineering, University of Delaware — De novo designed beta hairpin peptides with asymmetric beta strands, capable of self-assembly and hydrogel formation, were investigated. The stimuli responsive self-assembly occurs via a strand interdigitation mechanism, resulting in physically crosslinked fibrillar networks. Fibrils with distinct nanostructures varying from non-twisted, twisted to laminated morphologies were rationally designed by modulating the peptide strand registry. The fractal dimension and correlation lengths of these networks, both, at the network as well as individual fibril length scales varies significantly with concentration and is directly related to the fibril morphology, as evidenced by SANS and cryogenic TEM. In case of the laminated fibrils, an increase in the peptide concentration induces a change from surface to mass fractal behavior at high q due to the disruption of fibril lamination as a result of faster assembly kinetics from higher peptide concentration. Non-twisting peptide fibril morphologies exhibit an increase the network density with higher peptide concentration and, therefore, an increase in mass fractal dimension. Oscillatory rheology of hydrogels reveals enhanced moduli for laminating networks over non-twisting or twisting networks. These interdigitating peptides constitute a model system to study structure-property relations in other semiflexible networks.

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