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Structure and Rheology of Leucine Zipper Protein Hydrogels B.D. OLSEN, J.A. KORNFIELD, D.A. TIRRELL, California Institute of Technology — Protein hydrogels from telechelic polymers physically crosslinked by the specific association of leucine zipper domains provide fundamental insight into polymer network structures due to the unparalleled control over molecular weight and network junction multiplicity. Two different leucine zippers are used to confer either tetrameric or pentameric end block association. By varying the length of the polyelectrolyte midblock, we show that the structure and rheological properties of the hydrogels depend on both the polymer molecular weight and the aggregation state of the leucine zipper junctions. Cryo-TEM and negative staining are used together to visualize the gels, revealing heterogeneous structures. The gels are strongly shear thinning, and examination of Lissajous figures of stress vs. strain suggest a yielding mechanism. Under many conditions the gels can recover nearly their full strength less than a minute after the cessation of shear. These properties combined with the ease of biofunctionalization and pH and temperature responsive gelation transitions make the materials attractive for tissue engineering.

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