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Synthesis and mechanical properties of resilin-like hydrogels JUN CUI, MELISSA LACKEY, University of Massachusetts Amherst, GREGORY TEW, University of Massachussets Amherst, ALFRED CROSBY, University of Massachusetts Amherst — Resilience measures a material's efficiency for mechanical energy storage. Many materials exhibit high resilience at low strains, but relatively few can maintain this performance at high strain levels. One of the most notable examples of a resilient material is resilin, a protein used strategically when Nature requires elasticity with minimal loss over large deformations. Similar to resilin in many aspects, we present a novel hydrogel network with well-defined architecture by introducing hydrophobic polydimethylsiloxane (PDMS) into hydrophilic polyethylene glycol (PEG)-based network. As a function of the PDMS to PEG ratio, we demonstrate that maximum water content can range from 97% to 80% and Young's modulus from 5kPa to 75kPa. Across this full range of network compositions and water content, the resiliency is nearly 100% for uniaxial strains exceeding 80%. This unique balance of properties is associated with two network attributes: uniformity in network connectivity and negligible secondary structures.

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