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Mechanical enhancement through phase separation in a bicontinuous hydrogel network RYAN NIXON, THOMAS ANGELINI, Univ of Florida - Gainesville — Bicontinous networks of phase separated polymers are often used in biomedical materials to control the spatial distribution of multiple surface functionalities. Here we describe a different use of phase separation, which leverages a balance of aggregating and swelling tendencies of the two separated components, producing a hydrogel that is highly stretchable and resilient after large extensions. In contrast to the typical one-component hydrogel, which is brittle and weak, the two-component micro-phase separated hydrogel recovers within just a few minutes after being stretched by several hundred percent, and fails at about 1000% strain. Our preliminary 3D reconstructions of the bi-continuous phases suggest that the gel's material properties arise from a system-spanning network of non-specific hydrophobic bonds that can be broken and re-formed under cycles of large strain, while elasticity is provided by the highly-solvated hydrogel that makes up the complementary phase.

Ryan Nixon
Univ of Florida - Gainesville

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