Fiber-reinforced tough hydrogels
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ABSTRACT
We study the mechanical behavior of fiber-reinforced hydrogel composites. Most hydrogels are weak and brittle. This makes it difficult to reinforce them with fibers as the fibers cut through the hydrogel under load. If the hydrogel is tough, however, the composite does not fail by fiber cutting; instead it fails by frictional sliding of the fibers allowing large deformation before failure. We present experimental results for a hydrogel composite where we used as matrix a recently developed tough hydrogel. We show that both stiffness and strength can be increased significantly by adding stiff fibers to the hydrogel and demonstrate that the composite gel fails mainly by fiber pullout.