

Description of Additional Supplementary Files

File name: Supplementary Movie 1

Description: Microfiber fabrication. This video shows the shape changes of internal oil droplets shortly after the aqueous alginate-diatomite jet has just encountered the CaCl_2 solution by asymmetric shear forces on both sides of the droplet. The external flow rate is 1 mL h^{-1} and the internal flow rate is 0.2 mL h^{-1} .

File name: Supplementary Movie 2

Description: Reciprocal deformation during hydration. This video shows the reciprocal deformation when a dehydrated microfiber was put in distilled water. The curvature radius of this microfiber decreased first and then increased over time.

File name: Supplementary Movie 3

Description: Reciprocal deformation during dehydration. This video shows the reciprocal deformation when a hydrated microfiber was put on a heating plate under the temperature of $50 \text{ }^\circ\text{C}$. The curvature radius of this microfiber increased first and then decreased over time.

File name: Supplementary Movie 4

Description: Transportation of an oil droplet. This video demonstrates the application of a microfiber actuator to deliver an oil droplet onto a glass substrate and then spontaneously disengage from the substrate by harnessing reciprocal deformation.

File name: Supplementary Movie 5

Description: Transportation of a glass ball. This video demonstrates the application of a microfiber actuator to transport a solid cargo to the destination with spontaneous disengagement by harnessing reciprocal deformation.