

Hierarchically Arranged Helical Fiber Actuators Derived from Commercial Cloth

Abstract

The first hygroscopically tunable cloth actuator is realized via impregnation of a commercial cloth template by a three dimensionally (3D) nanoporous polymer/carbon nanotube hybrid network. The nanoporous hybrid guarantees diffusion of water into the cloth actuator and amplifies the deformation scale. The cloth actuators are mechanically stable with high tensile strength. Because the commercial cotton cloth is inexpensive, such actuators capable of complex motions can be produced in a large size and scale for a wide variety of utilities (e.g. electric generators and “smart” materials).

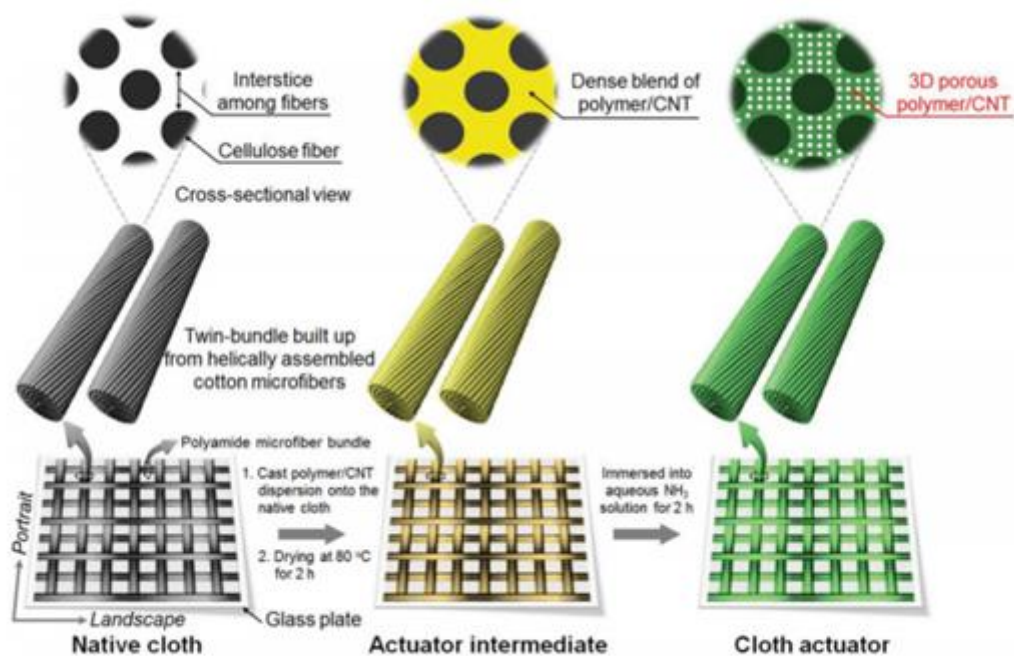


Figure 1. Fabrication scheme of the cloth actuator from a native cloth (containing helical cotton microfiber arrays in the portrait orientation and polyamide microfiber bundles in the landscape orientation) and an in situ generated 3D porous polymer/CNT hybrid network.