
Abstract
Graphene fiber-based electrodes for supercapacitors are promising candidates for wearable energy storage. Their main limitation, although, is the low electrochemical performance caused by the restacking of graphene sheets and their hydrophobicity to electrolytes. Incorporation of nanofillers into graphene is an efficient way to overcome the challenges, however, often leading to a severe deterioration in their mechanical property and/or conductivity, thus significantly influences the practical applications and rate performance of the device. Herein, an approach of fabricating hybrid fibers from graphene oxide (GO) and cellulose nanocrystal (CNC) via non-liquid-crystal spinning and followed by chemical reduction is presented to collectively work around the problems. The resultant hybrid GO/CNC fibers demonstrated a high capacitive performance, enhanced mechanical property, and improved hydrophilicity simultaneously. Furthermore, the conductivity kept at a high value. Sample with a GO/CNC weight ratio of 100/20 possessed a high capacitance of 208.2 F cm$^{-3}$, a strength of 199.8 MPa, a contact angle of 63.3°, and conductivity of 64.7 S cm$^{-1}$. Moreover, the supercapacitor assembled from this fiber exhibited a high energy density and power density (5.1 mW h cm$^{-3}$ and 496.4 mW cm$^{-3}$), excellent flexibility and bending stability, which has a great potential for use as a flexible power storage.