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ABSTRACT

Structural supercapacitors provide a variety of opportunities for woven carbon fibers in portable electronics, hybrid automobiles and aerospace applications. We describe herein the synthesis of bimetallic Cu-Co selenide nanowires based on woven carbon fibers, and their use as electrodes in supercapacitors. Woven Kevlar fiber is used as separator for the electrodes and a polyester resin with an ionic liquid and lithium salt is used as solid polymer electrolyte. The supercapacitors exhibit efficient energy storage and significant enhancements in mechanical strength (89.38%) and modulus (70.41%) over those of bare woven carbon fiber base supercapacitors. The specific capacitance of these supercapacitors increases from 0.197 F g^{-1} to 28.63 F g^{-1} after the growth of nanowires, with accordingly high energy density (191.64 mW h kg^{-1}) and power density (36.65 W kg^{-1}). In situ mechano-electrochemical tests of these supercapacitors yield excellent capacitance retention (77.3%) at the mechanical failure point (481.29 MPa).

Keywords: structural supercapacitor, multifunctionality, solid electrolyte, electrochemical performance, mechanical property

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