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The Recent Development of Eco-Friendly Supercapacitors

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Abstract

Carbon from biomass as an active material for supercapacitor electrodes has attracted m interest due to its environmental soundness, abundance, and favourable physical and chemical propertie this context, activated carbon prepared from coconut shells via a simple activation process (water or st as activation agents) was used as the active material in the fabrication of supercapacitors electro Activated carbon produced by this approach exhibits a graphitic phase, a high surface area, a large p volume, and high electrical conductivity. The energy storage properties of activated carbon electr correlate with the morphological and structural properties of the precursor material. In particular, electr made of activated carbon exhibiting the largest Brunauer–Emmett–Teller (BET) surface area, i.e. 1998 m showed a specific capacitance of 132.3 Fg^{-1} in aqueous electrolyte (1.5 M H_2SO_4), using expanded gra sheets as current collector substrates. Remarkably, this sample in a configuration with ionic liquid (1-me 1-propy-pyrrolizinium bis(fluorosulfonyl)mide) (MPPyFSI) as electrolyte and a polyethylene separ displayed a specific capacitance of 219.4 F g^{-1}. To the best of our knowledge, these values are the hig ever reported for ionic liquid-based supercapacitors with activated carbon obtained from the biomas coconut shells. We have also investigated the incorporation of Triton X-100, into the aqueous H electrolyte to make the polyethylene separator more compatible with the electrolyte by altering its sur properties. The addition of Triton X-100 to the H_2SO_4 electrolyte showed better permeability of ions thro the hydrophobic polyethylene separator by decreasing the contact angle from 101.5° to 30.2° for electrolyte. This change from hydrophobic to hydrophilic enhances the wetting of the separator membr facilitating ionic transport through the separator. This modification leads to a specific capacity of 55.3 with the addition of 48.8% (V/V) Triton X-100 to the 1M H_2SO_4 electrolyte concentration.