Highly Effective Hydrophilic Modified Carbon Microspheres for Electrochemical Double-layer Capacitors

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In this work, hydrophilic poly(N-vinylpyrrolidone) (PVP) were covalently attached to carbon microspheres (CMS) using the surface-initiate atom transfer radical polymerization method. The synthesis of the materials involves the functionalization of CMS carbon a covalent attachment of PVP. Chemical and morphological changes of the PVP-modified carbon microspheres surface were characterized in detail by X-ray fluorescence spectroscopy and scanning electron microscopy (SEM). Compared with the unmodified CMS, the modified carbon (P-CMS) show higher hydrophilic and have better wettability in an aqueous electrolyte. Owing to the enhanced surface affinity between carbon electrode and electrolyte ions, the P-CMS electrode exhibits much higher capacitance (230 F/g) than the CMS electrode (99 F/g) and better capacitance retention capability. The sample also showed an excellent cycling stability with only about 9% capacity decay at 0.5 A/g after 3000 cycles in 2 M KOH electrolyte. The easy surface modification method of carbon materials and smart capacitive performance of P-CMS makes it a promising electrode material for supercapacitors.

Keywords: Hydrophilic; supercapacitor; carbon microspheres; atom transfer radical polymerization; poly(N-vinylpyrrolidone)

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