Formation of CoO-NiO Nanoparticles on Nitrogen Doped Porous Carbon as High Performance Supercapacitor Electrode

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Doping porous carbon with transition metal oxides is highly desirable for high performance supercapacitors due to their synergistic effect. Herein, a highly dispersed CoO-NiO nanoparticle doped porous carbon (CoO-NiO@ZIF-C) was prepared by pyrolysis of Ni²⁺ and Co²⁺ ions impregnated ZIF-8. The metal nanoparticles catalyze the formation of graphitic carbon, while the N-doped carbon substrate confines the nanoparticles during the process. The resulted nanocomposite demonstrates excellent capacitive performance, which delivered a specific capacitance of 552.3 F g⁻¹ at current density of 1 A g⁻¹. Moreover, an asymmetric supercapacitor was successfully assembled using CoO-NiO@ZIF-C as positive electrode and reduced graphene oxide as the negative electrode. The two-electrode cell delivered a maximum energy density of 43.5 Wh kg⁻¹ at a power density of 1892.1 W kg⁻¹ with good stability.

Keywords: Supercapacitor; ZIF-8; CoO; NiO; graphitic; Nanocomposite

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