Conducting polymer/metal oxide and carbon nanotube/metal oxide composites for supercapacitor applications

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In the case of high energy and high power density electrochemical capacitors, so called supercapacitors, three dimensional and mesoporous structures are desirable for electrode materials because the porous structures offer large surface areas for electrode-electrolyte reactions and enable electrolytes easily to penetrate through the entire electrode matrix. Recently, we reported a synthetic method to fabricate nickel-cobalt hydroxide nanostructures using chemical bath deposition. The synthesized nickel-cobalt hydroxide nanorods achieved specific capacitances as high as 1200 F/g. However, key weaknesses of nickel-cobalt hydroxide are limited electric conductivity and narrow potential window so that its energy density is relatively low. In the present work, we report unique methods to fabricate nickel-cobalt hydroxide nanorods composites with CNTs or conducting polymers and analyze their electrochemical properties and supercapacitor performances.