Cobalt Hydroxide Nanoflakes Prepared by Saccharide-Assisted Cathodic Electrochemical Deposition as High Performance Supercapacitor Electrode Material

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Cobalt hydroxide flake-like nanostructures are prepared through green electrochemical synthesis procedure. In this way, an aqueous solution of 0.005M cobalt chloride and 1g/L starch was used as an electrosynthesis bath. The cobalt hydroxide deposit was prepared in a two-electrode system containing stain less steel cathode and graphite anode by applying current density of 10 mA cm⁻². The structural characterization by XRD, IR, FE-SEM and TEM confirmed that the deposited sample is composed of β -cobalt hydroxide with flake-like morphology. The charge storage ability of the prepared nanoflakes was further evaluated using cyclic voltammetry (CV), galvanostat charge-discharge (GCD) cycling and electrochemical impedance spectroscopy (EIS). The electrochemical measurement revealed that the prepared cobalt hydroxide has low equivalent series resistance (R_s) and charge transfer resistance (R_{ct}), which enabled the fabricated electrode to deliver specific capacitances as high as 1125.4, 992, 849.3, 701.6 and 452.5 F g⁻¹ at 1, 2, 3, 5 and 10 A g⁻¹, respectively, and capacity retentions 93.48% and 80.17% after 2000 GCD at the current loads of 1 and 5 A g⁻¹. These results supported the proper characteristics of the prepared nanomaterials for the supercapacitor applications.

Keywords: Cobalt hydroxide; Flake structures; Green Electrosynthesis; Supercapacitive performance

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