High Performance Pseudocapacitor Electrode Material Fabricated by Pulse Electro-Synthesized Cobalt Oxide Nanostructures

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High surface Co_3O_4 nanosheets were prepared by a facile two-step approach, including a pulsed cathodic deposition without any surfactant and followed calcination of precursor. The as-deposited material was composed of pure β -cobalt hydroxide with sheet-like morphology. The calcined product was cubic spinel Co_3O_4 phase with sheet texture according to X-ray diffraction and scanning electron microscopy. The oxide formation on heating was discussed based on the thermogravimetric data. Brunauer-Emmett-Teller (BET) measurement showed the high surface area of about $164 \text{ m}^2 \text{ g}^{-1}$ for the prepared cobalt oxide nanosheets. The pseudocapacitor capacitance of the prepared electrode was as high as 501.6 F g^{-1} at a current density of 2 A g^{-1} , and the cycling stability remained about 89.9% after 2000 cycles. The fabricated electrode delivered energy and power densities of 29.43 Wh/Kg and 0.33 W/g , respectively. These results confirmed the high pseudocapacitive performance of the prepared active nanomaterials.

Keywords: Co_3O_4 ; Nanoplates; Pulse Electrodeposition; Heat-treatment; Supercapacitive performance

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