Arginine-assisted Thermal Decomposition for Synthesis of Nanosized Co_3O_4 with Enhanced Capacitance

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Arginine-assisted thermal decomposition technique was used to prepare nanosized Co_3O_4 (A- Co_3O_4) with its supercapacitive performances checked. A- Co_3O_4 was characterized by different techniques such as X-ray diffraction, X-ray photoelectron spectroscopy, Fourier transform infrared spectroscopy and scanning electron microscopy. Brunauer-Emmett-Teller analysis revealed that A- Co_3O_4 had a larger specific surface area than Co_3O_4 prepared by conventional calcination without arginine (F- Co_3O_4). Electrochemical performances of A- Co_3O_4 based electrode were better than that of the F- Co_3O_4 based electrode. Cyclic voltammetric results showed the specific capacitances of A- Co_3O_4 and F- Co_3O_4 were found to be 259.2 and 122.2 F/g at a scan rate of 0.01 V/s. Long-term galvanostatic charge-discharge cycling tests indicated the specific capacitance for A- Co_3O_4 and F- Co_3O_4 were 128.6 F/g and 106.4 F/g with 104.7% and 103.3% capacitance retention after 1000 cycles at a current density of 5.0 A/g. Electrochemical impedance spectra analysis showed the charge transfer resistance (R_{ct}) of A- Co_3O_4 was 7.56 Ω and that of F- Co_3O_4 was 15.56 Ω . All the results indicated the A- Co_3O_4 exhibited superiority originated from large surface area with porous structure.

Keywords: Supercapacitor; Electrochemistry; Nanosized Co_3O_4 ; Thermal decomposition; Arginine

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