Morphology-Controllable Synthesis of one-dimensional ZnO nanostructures on graphene oxide-based electrode and its enhanced electrochemical performance for supercapacitor application

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Different morphologies of vertically aligned ZnO nanostructures were synthesized onto graphene oxide (GO) coated indium thin oxide (ITO) electrode by electrochemical technique and considered for supercapacitor application. The morphology of ZnO nanowires were successfully transformed and controlled into other morphologies like nanorods, nanocones and nanopillars by changing the applied current density and growth temperature. Structural and morphological studies indicated that the as-grown ZnO nanostructures were preferentially synthesized along the c-axis direction with hexagonal wurtzite structure. Cyclic voltammetry measurements of different morphologies of ZnO based electrodes confirms that cone-shaped ZnO nanostructures exhibited high specific capacitance of 463.7 F g^{-1} at 20 mVs^{-1} scan rate, which can be mainly associated with the higher specific surface area of ZnO nanocone electrodes than those of other morphologies.

Keywords: Graphene oxide; ZnO nanocones; Supercapacitor application; Cyclic voltammetry; Electrochemical impedance spectroscopy

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