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ZnWO₄ nanoflakes decorated NiCo₂O₄ nanoneedle arrays grown on carbon cloth as supercapacitor electrodes

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ABSTRACT: We have successfully realized a high-capacity, good-rate-capability, and long-life supercapacitor electrode by developing the hierarchical 3D NiCo₂O₄ nanoneedle arrays (NNAs)@ZnWO₄ nanoflakes (NFs) core-shell structures on carbon cloth (CC) for the first time. The free-standing CC@NiCo₂O₄@ZnWO₄ electrode gives rise to a high specific capacity of 296.5 Cg⁻¹ at a current density of 0.5 Ag⁻¹ and 269.0 Cg⁻¹ even at 10 Ag⁻¹, and retains ~90.1% of the capacity even after 5000 cycles of charge and discharge. Compared with CC@NiCo₂O₄ electrode, the remarkable electrochemical behaviors demonstrate that ZnWO₄ NFs decorated NiCo₂O₄ NNAs on CC as a new type of electrode is highly desirable for application as high-performance electrochemical supercapacitors.

Keywords: Carbon cloth; Nanoneedle arrays; Functional; Supercapacitors; Energy storage and conversion

1. Introduction

Recently, flexible energy-storage devices including supercapacitors and batteries have attracted significant attention for meeting the requirements of miniature intelligent electronic device, novel wearable electronic equipment and modern portable electronic instrument (for example, smart clothes, bendable mobile electronic products, and folding charger) [1-3]. Carbon cloth (CC) as a superior current collector,

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