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Three-dimensional Cage-like Co_3O_4 Structure Constructed by Nanowires for Supercapacitor

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Three-dimensional (3D) cage-like network architecture is constructed by cobalt oxide nanowires on porous nickel foam (donated as 3D cage-like Co_3O_4/NF) via a mild hydrothermal method. A series of measurements including X-ray diffraction (XRD), fourier transform infrared spectroscopy (FT-IR), field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM) are used to characterize the crystal structure, component and morphology of the as-prepared sample. The 3D cage-like hierarchical nanostructure increases utilization of active materials and shortens electrolyte ion transport pathway during the charging/discharging processes, leading to the excellent capacitive properties of the electrode materials. In a three-electrode system, the resultant electrode exhibits higher specific capacitance of 642 F g^{-1} and great rate capability (88% capacity retention at 10 A g^{-1}) in 3 M KOH solution. Importantly, the assembled asymmetric supercapacitor with a potential window of 1.7 V, in which 3D cage-like Co_3O_4/NF and graphene hydrogel (GH) are served as positive and negative electrode respectively, achieves the energy density of 31 Wh kg^{-1} along with power density of 854 W kg^{-1}, indicating a promising potential in the applications of energy storage.

Keywords: Cobalt oxide Nanowires; Cage-like architecture; Energy density; Asymmetric supercapacitors

FULL TEXT

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