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Abstract

As a new electrode material for supercapacitor, two dimensional (2D) porous cobaltite with spinel structure shows high specific capacitance, long cycle life and especially high energy density, which have great potential in electrochemical energy storage. In the present work, we demonstrated for the first synthesis of 2D porous $ZnCo_2O_4$ thin sheets (CQU-Chen-Zn-Co-O-2) with micro-mesoporous structure and high specific surface area of 89.63, 151.65 and 63.72 $m^2 \cdot g^{-1}$ through simple hydrothermal treatment of a mixed aqueous solution containing two kinds of transition metal nitrates (zinc nitrate ($Zn(NO_3)_2$) and cobalt nitrate ($Co(NO_3)_2$)) and benzoic acid (C_6H_5COOH) at 180, 200 and 220 °C for 12 h. The 3D nanoflake array assembled nanostructures of the $ZnCo_2O_4$ thin sheets facilitate the transmission of ions and electrons throughout the electrochemical testing process, which yield a higher specific capacitance of 3.07 $F \cdot cm^{-2}$ at 1.04 $mA \cdot cm^{-2}$ in a three-electrode system and a high energy density of 36.31 $Wh \cdot kg^{-1}$ at a power density of 850 $W \cdot kg^{-1}$ in an aqueous asymmetric supercapacitor ($ZnCo_2O_4$ thin sheets//active carbon (AC)). The results indicate that the 2D $ZnCo_2O_4$ thin sheets exhibt superior supercapacitor performance.

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