Hydrothermal Synthesis of Mesoporous Carbon Sphere/Nickel Cobalt Sulfide Core/Shell for Supercapacitor Electrode Material

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Electrochemical supercapacitors have attracted considerable attention because of their high potential as an efficient energy storage system. The combination of carbon-based material and transition metal oxides/sulfides are studied because they have long and improved cycle life as well as high energy and power densities. Moreover, metal sulfides have gained popularity because of their favorable performance, such as higher electrical conductivity, better mechanical and thermal stability compared to their corresponding metal oxides. Herein, mesoporous carbon sphere@nickel cobalt sulfide (CS@Ni-Co-S) core-shell was synthesized using hydrothermal method. The reaction involved green synthesis without further sulfurization or post-heat treatment. The CS@Ni-Co-S core-shell microstructures exhibited a high capacitance of 724 F g^{-1} at 2 A g^{-1} and a retention of 86% after 2000 charge/discharge cycles. The electrode exhibited a high energy density of 58.0 Wh kg^{-1} (1440 W kg^{-1}) and high power density of 7200 W kg^{-1} (34.2 Wh kg^{-1}). This work provides an efficient, robust and cost-effective approach to obtain multicomponent-functional core-shell structure for supercapacitor electrode material.