World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:10, No:04, 2016

Hydrothermal Synthesis of Carbon Sphere/Nickel Cobalt Sulfide Core/Shell Microstructure and Its Electrochemical Performance

Authors : Charmaine Lamiel, Van Hoa Nguyen, Marjorie Baynosa, Jae-Jin Shim

Abstract : 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. In this study, a hierarchical mesoporous carbon sphere/nickel cobalt sulfide (CS/Ni-Co-S) core/shell structure was synthesized using a facile hydrothermal method without any 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 in a 6 M KOH electrolyte. After 2000 charge-discharge cycles, it retained 86.1% of its original capacitance, with high Coulombic efficiency of 97.9%. The electrode exhibited a high energy density of 58.0 Wh kg−1 at an energy density of 1440 W kg−1, and high power density of 7200 W kg−1 at an energy density of 34.2 Wh kg−1. The successful synthesis was considered to be simple and cost-effective which supports the viability of this composite as an alternative activated material for high performance supercapacitors.

Keywords : carbon sphere, electrochemical, hydrothermal, nickel cobalt sulfide, supercapacitor
Conference Title : ICNOP 2016 : International Conference on Nanotechnology, Optoelectronics and Photonics
Conference Location : Istanbul, Türkiye
Conference Dates : April 19-20, 2016