Simple Fabrication of Nickel Sulfide Nanostructured Electrode Using Alternate Dip-Coating Method and Its Supercapacitive Properties

Jinhyeon Kang, Ilhwan Ryu, Geunpyo Choe, Green Kim, Sanggyu Yim*

Department of Chemistry, Kookmin University, Seoul 136-702, South Korea

*E-mail: sgyim@kookmin.ac.kr

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In order to make best use of the superior electrochemical properties of nickel sulfide (NiS) as an electrode material for supercapacitors, increase in surface area through electrode nanostructuring is one of the major issues. However, currently used NiS nanostructuring methods, such as hydrothermal and solvothermal techniques, require high-temperature, long and complicated nano-processes, and hence are not suitable for practical use. In this work, we developed a new, simple method for fabricating porous, nanostructured NiS electrodes by dipping a titanium oxide (TiO₂) nanoparticle-deposited substrate in nickel acetate and sodium sulfide solutions, alternately, at room temperature. One cycle of this alternate dip-coating process takes only 6 min and the amount of deposited NiS can be easily controlled by the number of deposition cycles. Maximum specific capacitance (C_{sp}) of 1044 F/g, comparable to the values of previously reported NiS nanostructure electrodes, was obtained. The voltammetric response retention at high scan rates was also improved by the nanostructuring, exhibiting a value 1.5 times larger than that of the planar film electrode.

Keywords: supercapacitor, nickel sulfide, nanostructured electrode, alternate dip-coating.

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