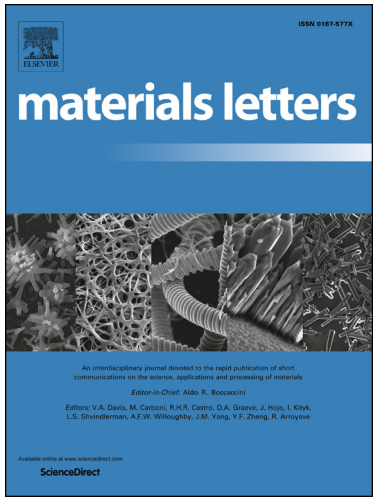

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Synthesis and Characterization of $NiO/Ni_3V_2O_8$ Nanocomposite for Supercapacitor Applications

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Abstract

Size and shape controlled nickel oxide/nickel vanadate ($NiO/Ni_3V_2O_8$**)** nanocomposites were achieved by solvothermal method. Ammonium metavanadate and nickel chloride precursor solution in appropriate proportion was dissolved in solvent with sodium hydroxide as reducing and stabilizing agent. Three different products were obtained by varying solvothermal processing time as 10 h, 14 h and 18 h at 160°C. X-ray diffraction (XRD), Fourier-transform infrared (FTIR), Raman and photo luminescence (PL) studies substantiate $NiO/Ni_3V_2O_8$ formation. Field emission scanning electron microscope (FESEM) studies provides detailed information about $NiO/Ni_3V_2O_8$ nanorods configuration. Electrochemical studies were carried out to understand pseudocapacitive properties of obtained products. Estimated specific capacitance for product PVK1 has superior value as 653 Fg^{-1} at current density 1 Ag^{-1} due to nanorods regular arrangement with uniform size distribution.

Keywords: $NiO/Ni_3V_2O_8$ nano-composites, nano-rods, solvothermal, pseudocapacitors, electron microscopy, energy storage and conversion

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1. Introduction

An ultra capacitor or supercapacitor has been recognized as an excellent energy storage device with prominent materials properties than batteries due to their inherent properties. Efficient faradic reaction in supercapacitor electrodes generates high power density except often troubled by low energy density and cyclic stability. Generally, supercapacitor device will have two important properties. One is energy transforming activity between two electrodes [1] and other high range capacitive ability of redox reaction results in pseudo capacitive nature which preserving high amount of electrical supply and long time durability [2]. Recently, transition metal oxides such as MnO_2, NiO, Co_3O_4, SnO_2, ZnO, TiO_2, V_2O_5, CuO, Fe_2O_3, WO_3 [3-14] and other multifunctional materials plays a vital role to gain high capacitance and power density by controlling their pore