Electrochemical investigation of $NiMnO_3$ as supercapacitor material

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Supercapacitors as one of the alternative energy storage/conversion systems have attracted great interest in recent years. These systems benefit from high power densities and long cycle life [1, 2]. Many metal oxide thin film electrodes have been investigated as supercapacitors and showed good capacitances originated from their redox transitions. However, the low conductivity of these oxides is the main disadvantage which motivates further research in this field. One of the ways for overcoming this disadvantage is utilizing combined electrode materials of metal oxides. Several bimetal oxides have been used and showed better capacitive behavior than corresponding metal oxides [3, 4]. In the present study, nickel manganese oxide has been prepared by coprecipitation method [6]. The prepared sample has been characterized using XRD technique, revealing the ilmenite phase ($NiMnO_3$) [5]. Active material was mixed with different graphitic materials. Based on the obtained results, graphite showed more working potential range and higher current densities than other samples. Electrodes were fabricated by spraying the suspended materials to nickel grid as the substrate. The electrochemical supercapacitive behavior of the materials has been investigated using cyclic voltammetry and galvanostatic charge–discharge methods. It was found that the mixed $NiMnO_3$/graphite (0.5:0.5) sample has the highest capacitance compared to other electrodes. NiMnO3/graphite based supercapacitors have showed specific capacitance of 54 $F.g^{-1}$ at discharge current density of 0.1 $A.g^{-1}$.

References

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