

SYNTHESIS OF CARBON-SUPPORTED MANGANESE (IV) OXIDE NANOCOMPOSITES FOR SUPERCAPACITORS APPLICATION

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In this study, the carbon-supported MnO₂ nanocomposites have been prepared using the microwave-assisted heating method followed by two different approaches. The MnO₂/C nanocomposite, labeled as sample S1, was prepared directly by the microwave-assisted synthesis of mixed KMnO₄ and carbon powder components. Meanwhile, the other MnO₂/C nanocomposite sample labeled as S2 was prepared indirectly via a two-step procedure which involves the microwave-assisted synthesis of mixed the KMnO₄ and MnSO₄ components to generate MnO₂ and subsequent secondary microwave heating of synthesized MnO₂ species coupled with graphite powder. Field-emission scanning electron microscopy (FE-SEM), transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD) and inductively coupled plasma optical emission spectroscopy (ICP-OES) has been used for characterization of MnO₂/C nanocomposites morphology, structure, and composition. The electrochemical performance of nanocomposites has been investigated using cyclic voltammetry and galvanostatic charge/discharge measurements in a 1 M Na₂SO₄ solution. The MnO₂/C nanocomposite, prepared indirectly via a two-step procedure display substantially enhanced electrochemical characteristics. The high specific capacitance of 980.7 F g⁻¹ has been achieved from cyclic voltammetry measurements, whereas specific capacitance of 949.3 F g⁻¹ at 1 A g⁻¹ has been obtained from galvanostatic charge/discharge test for sample S2. Besides, the specific capacitance retention was 93% after 100 cycles at 20 A g⁻¹, indicating good electrochemical stability.

Reference

1. J. Jablonskienė, D. Šimkūnaitė, J. Vaičiūnienė, G. Stalnionis, A. Drabavičius, V. Jasulaitienė, V. Pakštas, L. Tamašauskaitė - Tamašiūnaitė, E. Norkus. "Synthesis of Carbon-Supported MnO₂ Nanocomposites for Supercapacitors Application". *Crystals* **11** (7) (2021) 784.