Electrochemical Characterization of Carbon Blacks Filler-Added Co_3O_4/Graphene Nanosheets Composite Electrodes

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Supercapacitors attracted much attention because of their pulse power supply, long cycle (>100,000 cycles), simple principle, and high dynamic of charge propagation. Supercapacitors are probably the one of the most important next generation energy storage device [1-3].

Most research in this area has focused on the development of different electrode materials such as carbon, conducting polymers and transition metal oxides. Recent works have reported the usage of metal oxides coupled with graphene in energy storage applications [4].

In our study, a series of cobalt oxide/graphene nanosheets (GNS) have been successfully synthesized by adding carbon blacks filler. We have introduced carbon blacks to act as a structural modifier in fabricating graphene based composites. The composites were prepared by ultrasonication and microwave-assisted methods. Microstructure measurements showed that carbon blacks could be conductive links among layers of graphene and cobalt oxide particles (5~7 nm in size), which was deposited on the edge surfaces of nanosheets. The electrochemical properties are investigated by cyclic voltammetry (CV), galvanostatic charge/discharge and electrochemical impedance spectroscopy (EIS). The prepared nanocomposites showed the superior capacitive performance with good rate capability, large specific capacitance, and excellent cyclic performance. Among various samples, Co_3O_4/GNS-CB (15wt. %) showed the largest specific capacitance of 341 Fg^{-1} at a scan rate of 10 mVs^{-1} in 6 M KOH electrolyte. Therefore, the prepared composite could be potential electrode materials for supercapacitors. Fig. 1 represents microstructure diagram of the three types of composites.

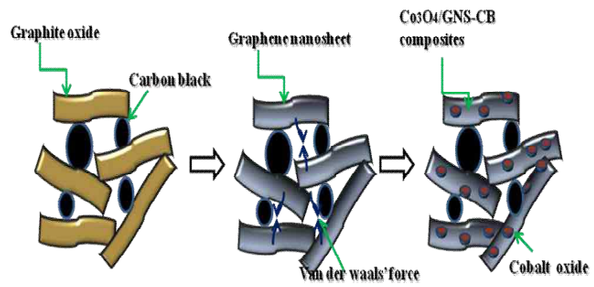

Fig. 1 Schematic representation of prepared samples

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